UTAH TRAUMA SYSTEM PERFORMANCE IMPROVEMENT GUIDE: FOR THE CRITICALLY INJURED

July 1, 2003

BUREAU OF EMERGENCY MEDICAL SERVICES
DIVISION OF HEALTH SYSTEMS IMPROVEMENT
UTAH DEPARTMENT OF HEALTH

Utah Department of Health

UTAH EMERGENCY MEDICAL SERVICES

Utah
Trauma System
Performance Improvement
Guide
For the Critically Injured

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Bureau of Emergency Medical Services
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Disclaimer: These indicators and related information are intended to be guidelines based on the best judgement of the committee for participants within the trauma care system. These indicators were designed to benchmark progress and evaluate system effectiveness. Individual indicators may not apply to every situation.

Dedication

This manual is dedicated to the members of Utah's excellent pre-hospital ambulance service programs, hospitals, and rehabilitation centers.

Special appreciation is extended to the members of the Trauma System Advisory Committee and Trauma Performance Improvement Team, without whom the achievements described in this manual would not have been possible.

Utah citizens and visitors owe a debt of gratitude to all the dedicated professionals and committed health care practitioners that are advocates for providing excellence in trauma care.

Dedication

The Utah Bureau of EMS would like to acknowledge the Iowa Department of Public Health for providing us with a template for the development of this quality improvement plan. For further information on the development of the Iowa plan, please contact the:

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I. Executive Summary

Purpose

This guide has been developed by the Utah Department of Health, Bureau of Emergency Medical Services (BEMS) and the members of the Trauma Performance Improvement Team (TPIT) and Trauma System Advisory Committee (TSAC). The purpose of this document is to provide pre-hospital providers and hospitals with a summation of the processes and activities that will become the guidance for the evaluation of the Utah trauma system.

One goal of the Bureau of EMS is to establish an inclusive statewide trauma system that ultimately matches the needs of the patients with the facility resources to achieve cost-effective and optimal trauma care. According to the American College of Surgeons, an inclusive trauma system "strives to meet the need of all injured patients requiring an acute care facility, regardless of severity of injury, geographic location, or population density."

It is a recognized fact that hospitals that have not voluntarily chosen to be a designated trauma center provide the majority of "trauma" care to patients with moderate or minor injuries. All acute care hospitals, by virtue of their licenses, provide care for the sick and injured. The focus of this guide is to provide facilities and EMS providers with an understanding of the statewide system evaluation process and suggestions for performance improvement measures that can be used within regions, hospitals or agencies. Integration of the trauma system into the EMS system requires the development of such plans or guides.

The various sources of patient data and the performance improvement process should drive the development of the statewide trauma system. Initially, the evaluation process will address major or the most critically injured "trauma" patients who require immediate treatment and possible transfer to a trauma center. A Level I and II Trauma Center is a key component in an inclusive trauma system that encompasses all phases of care from pre-hospital to rehabilitation and the full range of injury severity. A Level I or II Trauma Center serves as the definitive care facility prepared with specialists that are guaranteed to be immediately available for the most critically injured patients.

Operational Concept

Hospitals and EMS agencies are required to measure and evaluate the care they provide to their patients. There are many terms used to "evaluate" care. Quality assurance has evolved into total quality management and continuous improvement. Today, the preferred terminology is "performance improvement." According to the American College of Surgeons, "performance improvement emphasizes a continuous multidisciplinary effort to measure, evaluate and improve both the process of care and

the outcome." Monitoring and reducing variation in care, as well as gaps in care are objectives of performance improvement.

Statutory and Regulatory Duties

According to the Utah EMS System Act, Chapter 8a, the "Department shall facilitate the ongoing evaluation and refinement of the statewide trauma system" and "implement a quality assurance program using information from the trauma registry." To assist the Department in activities related to the fulfillment of these statutory responsibilities, the BEMS established the multi-disciplinary review team called the Trauma Performance Improvement Team. The Director of the Utah Bureau of Emergency Medical Services appoints the members of the TPIT. The TPIT and other trauma committees will assist the BEMS in the execution of the statewide trauma performance improvement guide.

Trauma Data Collection System

In 1993, the BEMS, through a request for proposal process and a selection committee, purchased trauma registry software from Clinical Data Management for all acute care facilities in Utah. Training was provided to specified individuals from each acute care facility. This was a voluntary system and only University Hospital, LDS Hospital, Ogden Regional Medical Center, McKay-Dee Hospital, Utah Valley Hospital and Primary Children's Medical Center submitted data on a regular basis.

In the 2000 Legislative session, the EMS System Act was modified and each acute care facility was required to submit trauma registry data until July 2003. The Utah Department of Health, Intermountain Injury Control Research Center (IICRC) and Cheryl Soshnik, RN, Trauma Registry Consultant, began building Utah's three-pronged trauma data collection system in September 2000. The large facilities and designated trauma centers upgraded their software and currently utilize the TraumaBase program. The Department of Health purchased the TraumaBasic software for medium sized hospitals (200 or more cases that meet the inclusion criteria). Small facilities (with less than 200 cases meeting the inclusion criteria) provided copies of patient records to the IICRC which entered the data into the registry.

As the state repository for the trauma registry, the IICRC has compiled and analyzed the complete set of 2001 trauma registry data. This information is now available to the Department of Health, TSAC and TPIT for use in evaluating the statewide trauma system. The aggregate data is also available to each facility on a secure website so that they may run standard reports or ad-hoc reports. This "Trauma Cube" allows hospitals to compare their individual hospital data with aggregate data from similar facilities.

In the recent 2003 Legislative session, the EMS System Act was once again modified to extend the data collection date from July 30, 2003 to December 31, 2006. This extension will allow additional time to collect and analyze the data allowing the

Department to trend the incidence, causes and outcomes of trauma and better evaluate the effectiveness of the trauma health care delivery system.

Guide Format and Intent

This guide outlines a four-phase process that will provide direction and focus for the fulfillment of the Department's statutory responsibilities. This guide identifies four phases:

1. The identification of the elements and components of Utah's trauma system and the purpose of the statewide trauma performance improvement guide.

2. The development of a state assessment model that will guide Utah's trauma system towards continuous performance improvement for trauma care.

3. The establishment of a monitoring process for evaluation of Utah's statewide trauma system.

4. The establishment of a process for performance improvement and follow-up.

Hospital, pre-hospital, and overall system recommended indicators and proposed goals have been developed to initiate system evaluation. Indicators, transport and transfer guidelines, and proposed goals may change as more data becomes available and as our trauma system continues to evolve. This evolution is dynamic, and will identify new system (external) performance improvement initiatives for Department consideration.

Pre-hospital providers and hospitals are encouraged to simultaneously conduct internal performance improvement activities using additional indicators developed locally to monitor activities and issues unique to their own institution or agency. This guide is intended to identify required indicators to trauma centers and recommended indicators for hospitals and EMS providers.

As a result of Utah's trauma system performance improvement initiatives, access to timely and appropriate trauma care will continue to improve throughout the state.

II. Introduction

According to the American College of Surgeons, trauma is "a term derived from the Greek word for "wound"- it refers to any bodily injury." Injury is defined as "the result of an act that damages, harms or hurts; unintentional or intentional damage to the body resulting from acute exposure to mechanical, thermal, electrical or chemical energy or from the absence of such essentials as heat or oxygen." Traumatic injuries are classified into three categories: minor, moderate, and major (severe or critical). The majority of this guide will focus on the treatment, triage transport and transfer of major trauma patients.

Trauma care represents a coordinated health care delivery system extending from prevention to acute care and through rehabilitation. The coordination of this system (within each health care provider organization and across systems) requires the cooperation of multidisciplinary trauma care providers and urban, rural, frontier and sub-frontier resources in each phase of care. A systems approach to trauma care recognizes this continuum of care and reduces costs, disability, and death associated with traumatic injury.

For this reason, Utah is striving to establish an inclusive trauma system that is geared to achieve optimal cost effective trauma care in recognition of the unique needs of a predominantly urban population and rural geographic state. An inclusive trauma system recognizes the importance of all participants in the system. This includes all hospitals (trauma care facilities), EMS providers, and rehabilitation centers.

The Utah Department of Health is authorized by Chapter 8a, Title 26, The EMS System Act, Utah Code Annotated, as the lead agency responsible for the development and implementation of a statewide trauma care delivery system. To fulfill our responsibilities, the TPIT has been created to develop, implement, and conduct trauma care system evaluation, performance assessment, and performance improvement. This is a unique responsibility that provides an opportunity to develop a trauma system reflective of state and national standards for trauma care.

The rewards of this process include not only the assurance of rendering optimal trauma care to Utah citizens and visitors but it also provides an educational and communication forum for the multidisciplinary sharing of ideas, knowledge, and skills.

III. Document Purpose

The purpose of this document is to describe the process by which the Department of Health will conduct *statewide* trauma care system assessment, evaluation, and improvement for the state of Utah. It also serves as a resource to identify recommended indicators for internal performance improvement activities for hospitals and EMS providers.

IV. Trauma Care System Quality Defined

A quality trauma care system includes services along the continuum of prevention, acute care from the time of injury to definitive care and rehabilitation. This will increase the likelihood of desired outcomes consistent with current knowledge and standards for preventing and reducing the consequences of injury.

V. Goals of the Utah Trauma System

As defined in the EMS System Act, Chapter 8a, Part 2a Statewide Trauma System, the goals of Utah's Trauma System are to:

- "promote optimal care of trauma patients by matching the injured patient's needs to existing resources so that appropriate, cost effective trauma care is achieved;
- alleviate unnecessary death and disability from trauma and emergency illness;
- inform health care providers about trauma system capabilities;
- encourage the efficient and effective continuum of patient care, including prevention, pre-hospital care, hospital care, and rehabilitative care; and
- minimize the overall cost of trauma care."

VI. Goals of the Department of Health and Trauma Committees

The goals of the Department of Health, Bureau of Emergency Medical Services, the Trauma System Advisory Committee and the Trauma Performance Improvement Team are to develop, implement, and conduct trauma care system evaluation, quality assessment, and performance improvement. The trauma committees will assist the Bureau in establishing standards for the collection of data, evaluation of the results and to recommend refinements in the established standards.

VII. TPIT Purpose and Membership

The **TPIT** provides a forum and an opportunity for statewide trauma system participants to come together to inquire and examine data and recommend quality improvement initiatives to the Utah Department of Health for Utah's trauma care delivery system. The Director of the Bureau of Emergency Medical Services appoints the members of the TPIT**.** The Trauma Performance Improvement Team is multi-disciplinary and represents the elements of the statewide trauma system. Specialized ad hoc teams may be created to address and propose solutions to specific issues identified through the trauma registry or assessment model.

VIII. Performance Improvement Program Overview

As trauma care systems have developed over the years, it has become evident that ongoing assessment, evaluation, and re-evaluation of the care of trauma patients and of a trauma system is essential to the nurturing and building of improvement initiatives focused on optimal patient care. The on-going assessment, evaluation, and re-evaluation of trauma care and of the trauma system must be done within a well-defined performance improvement process.

A trauma system performance improvement (PI) process consists of two major components: The **internal** component within each hospital or EMS provider agency, and the **external** (system) component. Trauma centers, resource hospitals and EMS providers are responsible to conduct internal PI. As stated in the EMS System Act, the Department of Health is responsible to establish a statewide quality assurance program. With the assistance of this guide and the TPIT, the Department will conduct statewide external PI. An overview of PI activities, their focus, and what entity typically performs the activity is found in the Appendix.

Performance improvement standards are defined and established for designated trauma centers in the 1995 Utah Trauma System Plan criteria. Performance improvement requirements are also defined and established for designated resource hospitals. All acute care facilities have been designated as resource hospitals. A resource hospital is defined as a facility designated by the EMS Committee to provide on-line medical control for the provision of emergency medical services. As stated in R426-13-200 Emergency Medical Service Provider Designations: "As of July 1, 2000, a hospital that provides on-line medical control for pre-hospital emergency care must first obtain a designation from the Committee as a resource hospital."

The responsibilities of a designated resource hospital, according to R426-15-400 Licensed and Designated Provider Operations are as follows:

(3) "The hospital must establish and actively implement a quality improvement process.
(a) The hospital must designate a medical control committee.
(b) The committee must meet at least quarterly to review and evaluate pre-hospital emergency runs, continuing medical education needs and EMS system administration problems.
(c) The hospital must appoint a quality review coordinator for the pre-hospital quality improvement process.
(d) The hospital must cooperate with pre-hospital EMS providers' off-line medical directors in the quality review process."

There are performance improvement requirements outlined for EMS off-line medical directors as well. As stated in R426-14, Ambulance Service and Paramedic Service Licensure: "All licensed providers must have a certified off-line medical director." All licensees and quick response units must enter into a written agreement with a physician to serve as its off-line medical director to supervise the medical care provided by the field EMS personnel. An off-line medical director is defined as a physician that provides oversight of local EMS services and personnel to assure their medical accountability. R426-15-401 Licensed and Designated Provider Operations state that: "The off-line medical director shall:

(a) develop and implement an effective quality improvement program, including medical audit, review and critique of patient care;
(b) annually review triage, treatment and transport protocols and update them as necessary;
(c) suspend from patient care, pending Department review, field EMS personnel who do not comply with local medical triage, treatment and transport protocols, who violates any of the EMS rules, or who the medical director determines is providing emergency medical service in a careless or unsafe manner. The medical director must notify the Department within one business day of the suspension.
(d) attend meetings of the local EMS Council, if one exists, to participate in the coordination and operations of local EMS providers."

To assist trauma centers, resource hospitals and EMS agencies to conduct their internal PI reviews, guidelines and indicators have been provided for reference in the appendix of this document. In the past, PI programs have primarily focused on specific trauma hospitals rather than *system* based PI. Facility based PI is essential to the ongoing development and improvement of trauma care within the individual institution and or program while system based PI is essential to the ongoing development and

improvement of overall effectiveness of the system. There must be close cooperation between these programs in order to attain an acceptable standard of trauma care.

IX. Internal Performance Improvement Guidelines (hospital and ambulance service programs)

Quality of care can be evaluated on the basis of structure, process, and outcomes. Resources are characteristic of structure; components of the encounter between practitioner and patient are characteristics of process; and the patient's health status is characteristic of outcome.

Hospital and agency **(internal)** PI evaluates *structure* by monitoring availability of resources, equipment, communication, policies, procedures, and organization. Hospital and agency PI evaluates *process* by monitoring personnel availability, timeliness of treatment, procedures, adherence to protocols, appropriateness of care, and practitioner performance compared to an established norm. Hospital PI evaluates *outcome* by monitoring patient response to treatment, complications, morbidity, mortality, disability and effects of rehabilitation.

Trauma care facility PI programs are of paramount importance and cannot be under recognized. As Utah's trauma system continues to evolve, trauma care facilities across the state are developing and/or evaluating their respective internal PI programs for trauma care.

Please refer to the Appendix for specific guidelines and reference material on internal hospital and EMS provider agency PI programs and recommended performance indicators.

X. State Performance Improvement: DOH and TPIT Overview

The focus of **internal** PI is on individual practitioners and individual patients. The focus of **external** PI is on system components and overall system effectiveness. Both programs look at structure (resources), process (care delivered), and results (outcome), but differ in how this is accomplished. The key to success in any PI program is to base improvement initiatives on information that comes from valid and reliable data. Utah's trauma system has set the stage for trauma care facilities, ambulance service programs, and the Department of Health to do just that.

It is essential that system performance improvement be pursued to facilitate evolution of Utah's trauma system and to evaluate the overall effectiveness of the system. System **(external)** PI evaluates *structure* by monitoring hospital availability, ambulance service program availability, and overall resource availability. System PI evaluates *process* by monitoring patient triage and transfer, trauma system standards (local protocols or state guidelines), transport times, appropriateness of the receiving facility, appropriateness of inter-facility transfer, over-triage and under-triage, and how the components of the trauma system interact with each other. System PI evaluates *outcome* by monitoring morbidity, mortality, disability, and by monitoring the overall effectiveness of the system.

A. Building & Managing Utah's Trauma System Performance Improvement Process *(four phases)*

The Department and TPIT began the challenge of developing a system evaluation and performance improvement guide for Utah's Trauma System in September of 2001. This guide has been developed by the Department of Health and the appropriate trauma committees to complete the goal of monitoring and evaluating the Utah trauma system. The process included the four phases defined in the following sections.

B. PHASE ONE: Identification and definition of the elements of Utah's Trauma System and the purpose of the TPIT

OBJECTIVES:

- Define the purpose of TPIT.
- Identify and define the providers of the Utah Trauma System.
- Identify and define the elements of the Utah Trauma System.

1. The purpose of the Trauma Performance Improvement Team is to assist the Department of Health in developing, implementing, and conducting trauma care system evaluation, performance assessment, and performance improvement.

2. The providers of the trauma system are identified below:

a. **Primary**	b. **Secondary**
Patients	3rd Party Payers
Providers (agencies and And hospitals)	Taxpayers
	Stakeholders

3. The TPIT identified and defined the following elements of the trauma system:
   a. Air or Ground Ambulance - any privately or publicly owned air or ground vehicle specifically designed, constructed or modified, which is intended to be used for and is maintained or equipped with the intent to be used for, maintained or operated for the transportation of individuals who are sick, injured or otherwise incapacitated or helpless.
   b. Categorization - the process of identifying and developing a stratified profile of Utah hospital trauma critical care capabilities in relation to the standards defined under R426-5-7.
   c. Committee - the State Emergency Medical Services Committee created by Section 26-8a-104.
   d. Department - the Utah Department of Health, Bureau of Emergency Medical Services.
   e. EMS - emergency medical services.
   f. Emergency Medical Dispatch Center - an agency designated by the Department for the routine acceptance of calls for emergency medical assistance from the public, utilizing a selective medical dispatch system to dispatch licensed ambulances, paramedic services and designated quick response units.
   g. Hospital - a facility licensed under Utah Code or comparable emergency care facility located and licensed in another state.
   h. Inclusive Trauma System - the coordinated component of the State EMS system composed of all general acute hospitals licensed under Title 26, trauma centers, and pre-hospital providers which have established communication linkages and local triage protocols to provide for the effective management, transport and care of all injured patients from initial injury to complete rehabilitation.
   i. Off-line Medical Control - physician medical direction of pre-hospital personnel to assure medical accountability.
   j. On-line Medical Control - physician medical direction of pre-hospital personnel during a medical emergency.

k. Pre-hospital EMS Provider - any emergency medical care ambulance service or non-transport service that is licensed or designated by the Department.
l. Quick Response Unit - an organization that provides emergency medical services to supplement local ambulance services or provide unique services such as search and rescue or ski patrol.
m. Resource Hospital - a facility designated by the EMS Committee to provide on-line medical control for the provision of pre-hospital emergency care.
n. Selective Medical Dispatch System - a Department approved reference system used by a local dispatch agency to dispatch aid to medical emergencies which includes: systemized caller interrogation questions; systemized pre-arrival instructions; and protocols matching the dispatchers evaluation of injury or illness severity with vehicle response mode and configuration.
o. Trauma Center - a hospital designated by the Department and has been voluntarily verified by the Department as having Level I, II, III, IV or V trauma care capabilities and has been issued a certificate of designation pursuant to Utah Code.

The TPIT identified the following applicable components of the trauma system:

Prevention

a. Public Information & Education/Prevention - to heighten public awareness of injury as a preventable public health problem, of how to access the EMS system, and emphasize prevention as the key to reduce traumatic injuries.

Acute Care

b. Access/Communication Centers - the process by which the public places a call for help and how emergency medical services are mobilized. This also includes communication between facilities (e.g., consultation between physicians by means of phone, ICN, telemedicine.)
c. Pre-hospital Care - the evaluation, treatment, and appropriate field management of the injured patient at the scene by pre-hospital care providers.
d. Triage, Transport, and Transfer - the process by which patients are assessed for time critical injuries; the determination of the most appropriate transportation resources; and the determination of the most appropriate facility capable of meeting the needs of the injured patient.
e. Definitive Care - a network of trauma care facilities that provide a full spectrum of care for injured patients.

Rehabilitation

f. Rehabilitative Care – a network of facilities that provide care and reconditioning necessary to bring the patient back to maximal functional capacity in society.

It was recommended by the Team that the components of Utah's Trauma System be classified as **Prevention (a), Acute Care (b,c,d,e), and Rehabilitative Care (f).**

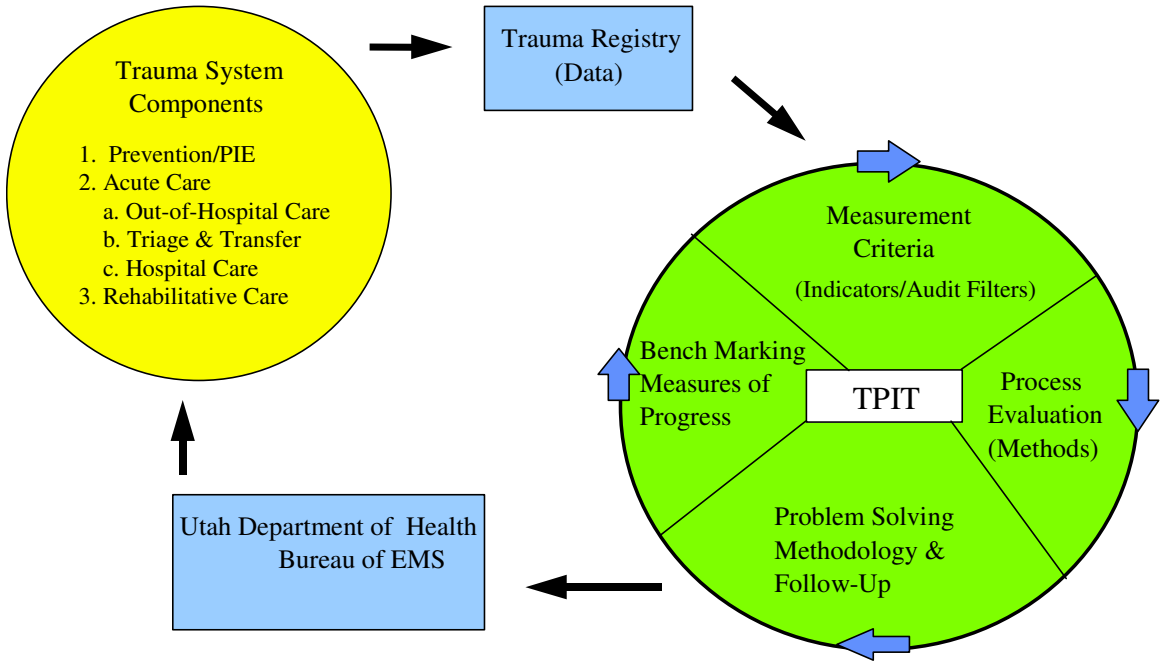
C. PHASE TWO: Development of a process management model to guide the trauma system toward continuous performance improvement.

OBJECTIVES

- Establish the elements of the process management model.
- Build the process management model.
- Establish the pathways/directions of the model and identify relationships between the elements.

As part of phase two, the TPIT recommended the use of a process management model that can guide Utah's Trauma System towards continuous performance improvement for trauma care. This involved identifying and defining the elements of the model, establishing pathways and directions for the model, and establishing relationships between the elements within the model.

D. Process Management Model



Hospitals will report information (data) to the Trauma Registry at the Utah Department of Health. The trauma registry data represents information regarding the most critically

injured patients. Pre-hospital, hospital discharge and eventually rehabilitation data will be linked to the trauma registry. The Department will develop a state report generated from the Trauma Registry. Specialized reports will be created based on the audit filters and performance indicators created by the TPIT. The Team will analyze the reports to identify strengths or areas needing improvement regarding the treatment, triage, transport and transfer of the most critically injured patients. Areas needing improvement will undergo further analysis, which may require additional information from the Trauma Registry or other available sources of data. Problem solving methods will be initiated and recommendations for improvement may be provided to the Department by the TPIT. A process to follow-up (re-evaluate) will be established for the recommendations made to the Department by the TPIT. Bench marking initiatives will commence with 2001 baseline information (data) obtained from the Trauma Registry.

E. PHASE THREE: Establish the monitoring process for evaluation of Utah's Trauma System

OBJECTIVES:

- Review the minimum standards established for Utah's Trauma System.
- Identify and define quality indicators/audit filters for each component of Utah's Trauma System.
- Identify and define adverse outcomes for each component of Utah's Trauma System.
- Establish and identify the process for monitoring and analyzing measurement data.

Phase three consists of the development of overall system indicators (audit filters) related to hospitals and pre-hospital providers. Benchmarks are established and utilized by the TPIT. As the committee receives outcome data from the trauma registry, these indicators and benchmarks could change over time.

The indicators for hospitals, EMS providers, and overall system effectiveness are located in the Appendix.

The **TPIT** will establish a meeting schedule to review reports generated from the trauma system. This will provide an opportunity for all team members to discuss findings and/or issues surrounding all indicators. A unanimous vote must be reached by the entire team on the recommendation to the Department regarding the appropriate course of action to resolve a sentinel event issue. A consensus must be reached on recommendations to the Department regarding actions to resolve data driven issues. Discussions and conclusions by the team will be documented in meeting minutes that will remain confidential.

Reports that include information surrounding all indicators will be provided to all team members present during scheduled TPIT meetings. Time will be allocated during the closed session for review of the information provided. Confidentiality of these reports will be maintained.

F. PHASE FOUR: Develop problem solving methodology including a process for corrective action and follow-up

OBJECTIVES:

- Identify and establish when corrective action is recommended/necessary.
- Establish problem-solving methodology.
- Establish process for initiating corrective action.
- Establish process for follow-up.

The TPIT has identified the following problem solving methodology:

1. Identify the problem and attach the problem to a component of Utah's Trauma System.

a. Prevention (primary/secondary)
b. Acute Care
   1) Pre-hospital Care
   2) Triage & Transfer
   3) Hospital Care
c. Rehabilitative Care

2. Is the problem a structure, process or outcome issue?

a. **Structure -** resource availability, personnel, equipment, financial, etc..
b. **Process -** policies, procedures, triage and transfer protocols, trauma system standards.
c. **Outcomes -** reduction of patient suffering, disability, death, and charges from time critical injuries.

3. What resource support currently exists and is available to TPIT?

a. **Utah Trauma System Plan 1995 and 2003**
Designation criteria listed in the 1995 Plan

b. **Trauma System Advisory Council (TSAC)**
Public Information, Education and Prevention Subcommittee
Facility Standards Subcommittee

c. **Trauma Review Team (consultation)**
Physicians
Nurses
State Trauma System Coordinator

d. **Utah Code & Supporting Administrative Rules**
Chapter 8a, Utah Emergency Medical Services System Act;
R426-5 Hospital Trauma Center Categorization Standards;
R426-12 Emergency Medical Services Training and Certification Standards;
R426-6 Emergency Medical Services Grants Program Rules;
R426-11Definitions and Quality Assurance Reviews;
R426-15 Licensed and Designated Provider Operations;
R426-13 Emergency Medical Services Provider Designations;
R426-14 Ambulance Services and Paramedic Service Licensure

e. **Education Programs**
Advance Trauma Life Support
Trauma Nurse Core Course or equivalent
TEAM (Together Everyone Achieves More)
Pre-hospital Trauma Life support or Basic Trauma Life Support

f. **Utah Department of Health**
Bureau of Emergency Medical Services
Bureau of Health Facility Licensure
Medicaid
Bureau of Health Promotion and Injury Prevention
Division of Community and Family Health Services

g. **National Resources/State Resources**
American College of Emergency Physicians, Utah Chapter
American College of Surgeons, Utah Chapter
Utah Association of EMT's
Utah Emergency Medical Services Association
Utah Emergency Nurses Association
Utah Nurses Association
Utah Medical Association
Utah Hospital Association
Utah Association of Fire Chief's
Local EMS Councils
EMS Medical Directors
Government
Publications

4. Identify what resource(s) are best utilized to change the problem or improve results that are less than favorable.

5. Initiate Corrective Action

A. Make recommendations to the Department for improvement based on:

a. Structure
b. Process
c. Outcome

B. *Recommendations should be classified as, but not limited to:*

a. **Structure:** (resources/standards) **-** TSAC, resource guide, Utah Code, administrative rules
b. **Process:** (policies/procedures/local protocols, guidelines) **-** TSAC, resource guide
c. **Outcome:** (consultation/education) **-** Department, verification survey Team, ATLS, TNCC or equivalent, EMS training programs

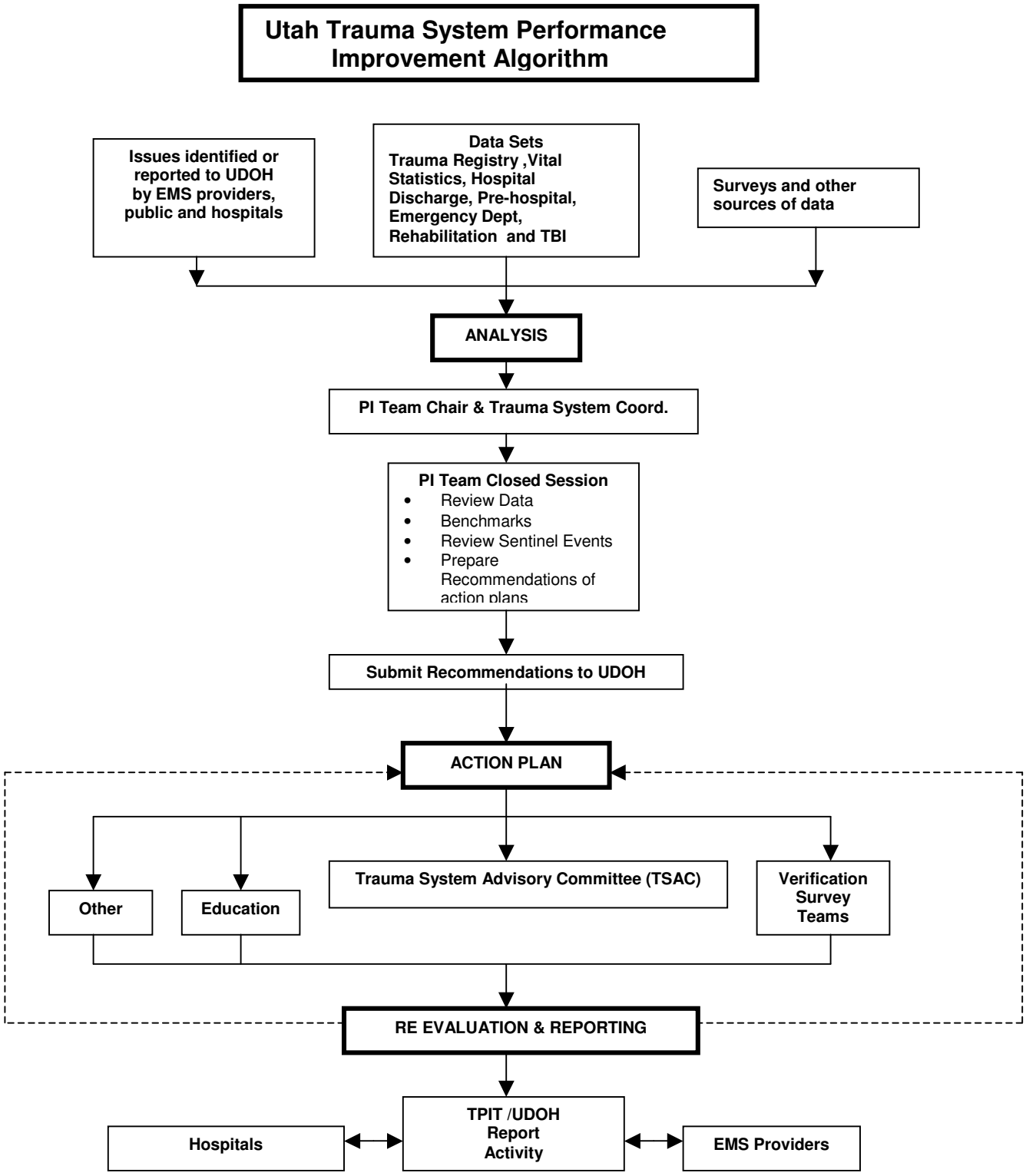
6. Process for follow-up and benchmarking.

A. Establish timeframe for follow-up and monitoring of indicators.

a. Quarterly
b. Annually
c. Per committee request

B. Establish benchmarks.

a. Obtain baseline data beginning with 2001
b. Establish benchmarks
c. Build timeline for goal accomplishment



Appendix A. Facility and System Performance Improvement Activity Template

Comparison of performance improvement activities among partners in Utah's trauma system.*

Component	EMS Provider	Hospital	Verification Team	State PI Team
Focus (internal vs. external)	**Internal EMS Provider** • Individual patient care events • Individual practitioners	**Internal Hospital** • Individual patient care events • Individual practitioners	**Internal Trauma Center and external system integration** • Individual trauma centers	**External state system issues** • Overall state
Pre-hospital Care	• Adherence to policy and local protocols or state guidelines • Timely response • Appropriate level of care • Treatment given • Timely prior notice given	• Adherence to policy and local protocols or state guidelines • Appropriate level of care • Effectiveness of care • Timely and accurate notification received for Trauma Team activation	• Timely on-line and off-line medical direction given • Out-of-Hospital PI with loop closure • Multidisciplinary trauma conference involvement	• System access • Adherence to triage and transport destination guidelines • Appropriate level of care • Effectiveness of care • Transport times
Hospital Care	• Availability of medical direction • Readiness to receive patient upon arrival at trauma center	• Adherence to policy and protocols • Trauma Team availability • Treatment given • Timeliness of care • Length of stay • Procedures • Care appropriateness	• Commitment by staff and administration • Presence of resources • Appropriate policies and credentialing process • Timeliness of response • CQI process • Facility performance profile • Inter-hospital transfer	• Regional and statewide performance profiles regarding timeliness and patient needs being matched to resources • Appropriate level of care • Inter-hospital transfer
Outcome of Care	Intermediate • Response to treatment • Complications Final • Practitioner performance • Morbidity/mortality	Intermediate • Response to treatment • Complications Final • Practitioner performance • Morbidity, disability, and mortality • Effect of rehabilitation • Financial impact	Intermediate • Overall response to treatment • Mechanism to identify and follow-up complications Final • Morbidity and mortality outcomes	Intermediate • Over triage rate • Under triage rate Final • Regional performance compared to the state • Preventable deaths • Disability rates • Financial impact
Other	Specific issues defined locally (facility and how it relates to the system)	Specific issues defined locally (facility and how it relates to the system)	Specific needs defined by the review Team (facility and system)	Specific needs determined unique to Utah's trauma system

*based upon guidelines from the American College of Surgeons (ACS) and the American College of Emergency Physicians (ACEP)

Appendix B. Internal Hospital Performance Improvement Guidelines

Hospital and agency **(internal)** Performance Improvement (PI) evaluates *structure* by monitoring availability of resources, equipment, communication, policies, procedures, and organization. Hospital and agency PI evaluates *process* by monitoring personnel availability, timeliness of treatment, procedures, adherence to protocols, appropriateness of care, and practitioner performance compared to an established norm. Hospital PI evaluates *outcome* by monitoring patient response to treatment, complications, morbidity, mortality, disability and effects of rehabilitation.

Trauma care facility PI programs are of paramount importance and cannot be under recognized. As Utah's trauma system continues to evolve, trauma care facilities across the state are developing and/or evaluating their respective internal PI programs for trauma care.

An effective **internal** PI program can be incorporated into already existing PI/QA processes within the organization but with a focus on trauma. It is recommended that an internal PI program employ an organized approach possessing the following elements:

- organization, authority to make change, standards of quality care;
- process for monitoring compliance;
- process for peer review; and
- process for implementing corrective action, evaluation, and re-evaluation.

1. Organization, Authority, & Standards of Care

a. Identify and develop a multidisciplinary trauma committee.
b. Develop standards of care.
c. Establish credentialing standards for practitioners.
d. Obtain administrative support for processes from the governing body of the hospital, medical staff, and hospital administration.
e. Identify and designate a responsible trauma service medical director (physician) & provide him/her with the appropriate authority to enact the process.
f. Identify and designate a responsible trauma coordinator and provide him/her with an appropriate job description to direct the process.

2. Monitoring Compliance

a. Define the trauma patient population to be monitored and inclusion criteria.

b. Establish a process for data collection.
c. Develop indicators (audit filters) for continuous and periodic evaluation. Use national and state indicators as a foundation.
d. Identify and define adverse outcomes based on pre-determined complications.
e. Establish a timeline for the evaluation of the data.
f. Identify who is responsible for compiling the data and reporting it to the trauma service medical director and multidisciplinary trauma committee.

3. Peer Review *(Confidential)*

a. Establish a systematic multidisciplinary peer review process for continuous and periodic evaluation of data and specific cases.
b. Establish a process (review) model.
c. Include, in this process, morbidity and mortality reviews with classification of preventable, possibly preventable, and non-preventable on all trauma deaths.
d. Provide written documentation of identified issues and opportunities to improve results that are less than favorable.

4. Implementing Corrective Action & Reevaluation

a. Define types of corrective action.
b. Establish a process to implement corrective action.
c. Develop an evaluation method to monitor the effect of the corrective action.
d. Define loop closure/resolution and establish a process to document.
e. Establish a process to periodically reevaluate the effectiveness of loop closure/resolution.

Appendix C. Internal Pre-Hospital Program Performance Improvement Guidelines

The ultimate goal of an EMS trauma PI program is the reduction of human suffering, disability, and death from injury. ***Efforts to achieve this goal serve to define the purpose of emergency medical services, while meeting this goal further justifies the very existence of EMS.***

Effective ambulance service PI programs are highly dependent on sound medical direction. Efforts to provide ongoing PI must be approached in a consistent manner, as well as positively focused, with the prevailing attitude that all EMS providers want to do a good job. The PI program in EMS should be an ongoing process to monitor standards at all operational levels, centered on the structure, process, and outcome of the patient care event.

Structure
Essentially, the EMS System structure is the setting in which the delivery of pre-hospital emergency medical services occurs. The actual structural component of the EMS system is the existing infrastructure that enables mobilization of a response to the scene of a trauma emergency. The availability of first responding and ambulance service personnel authorized to deliver service at a level of care appropriate for the needs of the community is a key structural element. In a trauma emergency, timely response capability, available and reliable equipment, adequate staffing and credentialing, and current protocols that support the delivery of pre-hospital standard of care are also vital structural needs. On-going education to include run critique and special training sessions, a provision for skills maintenance, and general community knowledge of how to access the EMS system are also important structural components.

Process
EMS System process refers to all actual patient care related activities. Typically, EMS system process is reviewed retrospectively during patient care record audits or run critiques, or in a skills performance session. However, it is beneficial for the medical director to spend time in the field to provide an accurate concurrent review of trauma care delivered by EMS providers.

Outcome
The result of the patient care event, or the outcome, essentially occurs as a result of the EMS trauma system structure in combination with the process activities of EMS providers. Typically, outcome is measured by compliance to protocols, the response of the trauma patient to specific care or procedures, and patient survival from life-threatening traumatic injuries. The ultimate goal being measured is the ability to reduce suffering, disability, and death due to injury.

Continuous improvement in emergency medical services is dependent upon a well-defined PI loop. Utilizing recognized state and national guidelines as a foundation, quality performance indicators are both broad and detailed in nature. After following an established process for data collection and review, information is examined. When data analysis indicates that a standard has not been met, the first step in problem solving should be to determine the cause. When adverse outcomes are identified, the individual EMS provider is frequently not the offender. Many times, difficulties may be rooted in the areas of EMS structure, or process. Education is commonly a positive factor in effecting changes that may be necessary. Occasionally, the quality standard may need to be redefined.

To be effective, the PI program should involve EMS providers, administrators, and medical directors in the role of reviewing and reporting. Involving EMS providers in the audit process is an important learning tool for them as they review the patient care reports of their peers for documentation and provision of care.

Feedback is important to advise EMS providers of positive areas as well as areas needing improvement. While a great majority of feedback may be appropriately given in group critique sessions, some information is better delivered on a personal one-to-one basis, especially when concerns exist regarding individual liability, competence, or interpersonal skills.

The potential for success of an EMS trauma quality management program is enhanced by building awareness that quality improvement is a worthwhile endeavor throughout an entire organization. By expanding workforce knowledge of quality improvement practices and fully integrating the strategic quality planning process and related quality improvement actions into daily operations, EMS agencies can work to assure that high quality care is delivered to trauma patients within the state of Utah.

STRUCTURE

- First Responders
- EMT Personnel
- Timely Response
- Reliable Equipment
- EMS Provider Credentialing
- Current Protocols
- Medical Direction
- Community Knowledge

Process

- Provider Impression
- Skill Performance & Interventions
- Scene Time

- Care Provided

Outcome

- Successful Procedures
- Improvement of Patient Condition
- Survival of Life Threatening Condition
- Patient Care Record Completeness & Accuracy

Appendix D. Required Trauma Center (internal) Indicators based on ACS Criteria

The Department and Trauma Performance Improvement Team have identified specific indicators (audit filters) that ***may*** be monitored by the (internal) trauma center PI program. Below is a list of indicators (audit filters) that are required for use as a trauma center and may be monitored by the Department and Trauma Review Team upon site review and verification of trauma center designation criteria.

Required Indicators – Level I and II Trauma Centers

- Attending surgeon's presence/response in the emergency department at the time of arrival of the trauma patient.
- Airway control and operative anesthesia capabilities.
- Medical staff specialist response/availability.
- Laboratory and x-ray availability within 30 minutes of arrival of the trauma patient in the emergency department and CT promptly available.

Required Indicators – Level III, IV and V Trauma Centers

- **(Level III only)** Surgeon presence/response in the emergency department at the time of arrival of the trauma patient.
- Appropriateness and timeliness of the physician providing initial emergency department care for the trauma patient.
- Anesthesia outcome studies.
- If teleradiology is utilized, monitor by the PI program.
- Nursing personnel and equipment available and ready for use upon arrival of the trauma patient in the emergency department.
- X-ray technician response times to the emergency department for the trauma patient.
- **(Level III only)** OR staff availability and response times to the emergency department for the trauma patient.
- Laboratory personnel availability and response times to the emergency department for the trauma patient.

Appendix E. Recommended Trauma Center (internal) Indicators Based on ACS Criteria

Recommended (internal) Trauma Center and Resource Hospital Indicators

The Department of Health and the TPIT have developed a list of ***recommended*** indicators (audit filters) that trauma care facilities are encouraged to utilize in their internal PI program. Below is a list of recommended indicators (audit filters) to be monitored by the internal trauma care facility PI program based on level of verification.

Recommended Indicators - Level I and II Trauma Centers

- Procedure times for definitive airway management and IV/IO access
- Trauma patients with unplanned re-operations within 30 days of their initial operation.
- Complications of acute renal failure and ISS $\geq$ 15.
- Trauma patients on a ventilator $\geq$ 30 days with ISS $\geq$ 15.

Recommended Indicators – Level III, IV and V Trauma Centers

- Response of the ATLS physician responsible for the initial resuscitation of the trauma patient in the emergency department
- Procedures times for definitive airway management and IV/IO access
- **(Level III only)** Trauma patients with unplanned re-operations within 30 days of their initial operation
- **(Level III only)** Complications of acute renal failure and ISS $\geq$ 15.
- Trauma patients on a ventilator $\geq$ 30 days with ISS $\geq$ 15.

Appendix F. Utah Trauma Registry Patient Inclusion Criteria

The first step in the development of valid and reliable data is a uniform set of data elements, definitions, codes, and inclusion criteria. The Utah Trauma Registry Data Dictionary outlines these standards for the Utah Trauma Registry. Trauma system improvement initiatives will be based on relevant information from data collected from all acute care facilities and pre-hospital providers.

The Utah Trauma System definition of a **(Trauma Patient**), means a victim of an externally caused injury that results in major or minor tissue damage or destruction caused by intentional or unintentional exposure to thermal, mechanical, electrical or chemical energy, or by the absence of heat or oxygen (ICD-9 International Classification of Diseases, 9th revision Codes 800.00-999.00). This broad definition reflects the need for the trauma registry, to the extent possible, to coordinate with other health data collection methods. This definition also allows for the inclusion of trauma patients meeting the farm-related injury and traumatic brain and spinal cord injury inclusion criteria within the trauma registry.

Although standard data elements are collected and reported, each program evaluates the data from a different perspective. This requires the need to categorize aggregate data at the system level into a *concurrent* definition of a major trauma patient **(Recognized Trauma Patient)** and a *retrospective* definition of a major trauma patient **(Major Trauma Patient).**

The *concurrent* definition of a major trauma patient **(RecognizedTrauma Patient),** is determined by the Pre-Hospital Trauma Transport Guideline and/or the Hospital Trauma Transfer Guideline that identifies a critically injured patient needing resources provided by a Level I or Level II trauma center.

The *retrospective* definition of a major trauma patient **(Major Trauma Patient),** is defined as any patient that has sustained a traumatic injury requiring medical care for that injury within 30 days from the injury date and at least one of the following conditions associated with the medical care received:

- Hospital admission lasting for at least two days; or
- Patient transfer via EMS transport from one hospital to another hospital; or
- Death resulting from the traumatic injury (independent of hospital admission, transfer or EMS transport); or
- Patient transport by air ambulance (including death in transport and patients flown in but not admitted to the hospital).
- AND

At least one of the following injury diagnostic codes defined in the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM):

- 800-959.9
- 760.5 (Fetus or newborn affected by trauma),
- 641.8 (antepartum history due to trauma), or
- 518.5 (pulmonary embolism due to trauma).

ICD-9 Codes 860.00-999.00 are excluded because they reflect poisoning and adverse reactions to medications. Additional exclusionary criteria includes patient that are:

- 65 years of age or older and
- sustain an injury due to same level fall

AND one of the following isolated injury diagnostic codes:

- 820.0-820.9 (isolated hip fracture),
- 808.2 (isolated fracture of the pelvis)
- 805 (isolated compression fracture of vertebral column without mention of spinal cord injury)
- 910-924 (blister, contusion, abrasions, and insect bites).

As the trauma registry evolves these types of injuries may be captured in specialty registries. The specific data elements included in the trauma registry are listed in the Utah Trauma Registry data dictionary available on the Intermountain Injury Control Research Center website.

Appendix G. Recommended Hospital System Indicators

1. Presence of trauma surgeon in ED upon arrival of designated trauma patient (<5 minutes of patient arrival) and/or

1a. The Trauma Surgeon response time is not documented.

2. "Recognized trauma patient" arrived at ED within 6 hours after injury occurrence.

2a. And/or the injury times are not documented.

3. "Recognized Trauma Patient" with GCS < 8 had definitive airway control prior to leaving ED and/or

3a. The definitive airway status for patient with GCS < 8 is not documented.

4. "Recognized Trauma Patient" with ISS > = 9 had vascular access established prior to leaving ED and/or

4a. The vascular status established for patient with ISS > 9 is not documented.

5. Probability of survival (Ps) was calculated on a recognized trauma patient – STR by hospital and/or

5a. The Ps is not calculated on designated trauma patient.

6. Trauma patients that were autopsied – State Trauma Registry or by hospital.

7. Safety equipment was documented for recognized trauma patients involved in motor vehicle, motorcycle, and bicycle collisions.

7a. The safety equipment was not used or was not documented.

8. Blood alcohol content was measured in recognized trauma patients age 16+ involved in motor vehicle, motorcycle, and bicycle collisions or in penetrating trauma.

8a. Blood alcohol content positive.

9. Drug screen was performed in recognized trauma patients age 16+ . involved in motor vehicle, motorcycle, and bicycle collisions or in penetrating trauma.

9a. Drug screen positive.

Disclaimer: These indicators and related information are intended to be guidelines based on the best judgement of the committee for participants within the trauma care system. These indicators were designed to benchmark progress and evaluate system effectiveness. Individual indicators may not apply to every situation.

Appendix H. Recommended Pre-hospital Provider Indicators

1. Trauma patients experienced cardiac arrest during transport to a trauma center/hospital by all ambulance service programs. **Indicator:** *cardiac arrest of a trauma patient occurring during transport to a trauma center/hospital by a pre-hospital provider.*

2. Trauma patients are dead at the scene upon arrival of a pre-hospital provider. **Indicator:** *trauma patient is dead at the scene based on local protocol or pronouncement of death at the scene upon arrival of a pre-hospital provider.*

3. Recognized trauma patients will arrive at a hospital with a managed airway. A managed airway is defined as one of the following or a combination of the following procedures, O2 by mask, intubation, combitube, or assisted ventilation. **Indicator:** *designated trauma patient arrives at a trauma center/hospital without a managed airway.*

4. Recognized trauma patients being transported from the scene by an EMS provider to a trauma center/hospital had a total transport time of $\leq$ 30 minutes. **Indicator:** *designated trauma patient with total transport time from the scene to a trauma center/hospital of > 30 minutes.*

5. Recognized trauma patients transported by all pre-hospital providers to a trauma center/hospital were treated at the scene by EMS personnel for < 10 minutes. **Indicator:** *recognized trauma patient is treated at the scene by EMS personnel for $\geq$ 10 minutes.*

6. Trauma patients transported by an EMS provider to a trauma center/hospital were attended at the scene by service program personnel within 20 minutes from dispatch. **Indicator:** *trauma patient transported by an ambulance to a trauma center/hospital is attended at the scene by EMS personnel in > 20 minutes from dispatch.*

7. Over-triage rate of 30% - 50 % of the trauma patients by EMS personnel. **Indicator:** *Trauma patient with ISS < 15 is identified as meeting steps #1 or #2 of the Pre-hospital Trauma Transport Guideline.*

8. Trauma patients meeting steps #1 or #2 of the Pre-hospital Trauma Transport Guideline as identified by EMS personnel, are treated at a Level I or II trauma center if that level trauma center is available within 30 minutes ground transport time. **Indicator:** *Trauma patient meeting steps #1 or #2 of the transport guideline treated at a non-designated facility if a Level I or II trauma center is available within 30 minutes ground transport time.*

9. **Goal:** Under-triage rate of < 5% of the trauma patients by EMS personnel.
Indicator: *trauma patient with ISS > 15 not identified as meeting steps #1 or #2 of the Model Pre-hospital Trauma Transport Guideline.*

Appendix I. Recommended Outcomes for Hospital Indicators

1. Survival Status
   a. Died
   b. Survived

2. Hospital Discharge Disposition
   a. Acute Care
   b. Died
   c. Home (left AMA)
   d. Other (e.g., skilled nursing facility, inpatient rehab facility, intermediate/residential facility)

3. Length of Stay
   a. 0-3 days
   b. 4-7 days
   c. 8-14 days
   d. > 15 days

4. Total Hospital Charges (dollars)
   a. $0-4999
   b. $5000-14,999
   c. $15,000-49,999
   d. > $50,000

Appendix J. Descriptive Report Content

Survival Rates

1. Total number and rate of deaths caused by injury per year by state and county.
   - A. By Age & Gender
     - 1) 0 - 17 years
     - 2) 18 - 44
     - 3) 45 - 64
     - 4) 65 & over
   - B. Total number of injuries urban, and rural by state and by county for:
     - 1) Work
     - 2) Home
     - 3) Farm
     - 4) Roadway

Types of Injury

1. Total Number of Deaths per year by state and by county.
   - A. Motor Vehicle Collision
   - B. Motor Cycle Collision
   - C. Pedestrian
   - D. Penetrating Injury
     - 1. Intentional
     - 2. Unintentional
   - E. Other

Charges

1. Total charges by Level I and II trauma centers per year for care of the trauma patient.
2. Total charges by Level I and II trauma centers per year by cause.
3. Total charges by Level I and II trauma centers per year by region.
4. Total charges by Level I and II trauma centers per year by severity.
5. Total charges by Level I and II trauma centers per year by 3rd party payer.
6. Total charges by Level I and II trauma centers per year for patients transferred in.
7. Total charges by Level I and II trauma centers per year for patients transferred from the scene to the trauma center.

Prevention

1. If death with MVC, was safety belt worn/airbags by state and by county.

2. If death with MCC, was safety helmet worn by state and by county.
3. If death on a farm – were farm safety precautions taken by state and by county.
4. Total number of injury deaths that were substance abuse related per year by state and by county.
5. If MVC caused death, was a car safety seat utilized (age group specific).

Transportation

1. Mode of transportation to initial to initial hospital per year by state and by county.
   A. Private Vehicle
   B. Ground Ambulance
   C. Air Ambulance

2. Utilization of transport for the dead per year by state and by county.
   A. Ground Ambulance
   B. Funeral Home

Autopsies

1. Total number of deaths caused by injury, autopsied per year by state, by and county.

Appendix K. Utah Trauma System Audit Filters

7/17/2003

Trauma patients who die in-hospital between 4 and 24 hours after the time of injury, stratified by hospital level. (Time from injury to hospital discharge used since time of death is not collected.)

List hospital, elapsed time, ED admission time, age, cause code, transport mode, and ISS for each patient meeting criterion.

Trauma patients with more than one inter-hospital transfer prior to definitive care. (Definitive care is defined as the final discharge hospital.)

List hospitals sending and accepting the transfer for each patient meeting criterion.

Ground transport trauma patients with an ED RTS less than or equal to 5.5 and scene transport times (scene departure to ED arrival) greater than 20 minutes.

List (and sort by) hospital, transport mode, EMS agency, scene to hospital transport time, injury county, cause code, ISS, and outcome for each patient meeting these criteria.

Revised Trauma Score

The Revised Trauma Score is a physiological scoring system, with high inter-rater reliability and demonstrated accuracy in predicting death. It is scored from the first set of data obtained on the patient, and consists of Glasgow Coma Scale, Systolic Blood Pressure and Respiratory Rate.

Glasgow Coma Scale (GCS)	Systolic Blood Pressure (SBP)	Respiratory Rate (RR)	Coded Value
13-15	>89	10-29	**4**
9-12	76-89	>29	**3**
6-8	50-75	6-9	**2**
4-5	1-49	1-5	**1**
3	0	0	**0**

RTS = 0.9368 GCS + 0.7326 SBP + 0.2908 RR

Values for the RTS are in the range 0 to 7.8408. The RTS is heavily weighted towards the Glasgow Coma Scale to compensate for major head injury without multi-system injury or major physiological changes. A threshold of RTS < 4 has been proposed to identify those patients who should be treated in a trauma center, although this value may be somewhat low.

Trauma patients with EMS scene times (EMS scene arrival to EMS scene departure) greater than 20 minutes.

List EMS agency, transport mode, scene time, scene procedures (air, CPR, fluids), trauma type, injury zip code (injury county), ISS, and outcome for patients meeting criterion.

Transferred trauma patients with an ISS greater than 15 and transfer time (ED admit to definitive hospital admit) greater than 6 hours for rural place of injury or 4 hours for urban place of injury.

List ED hospital, definitive hospital, urban or rural place of injury, transfer time, cause code, ISS, and outcome for patients meeting criteria.

Trauma patients with an ISS greater than 15 and ED time (ED admit to ED discharge) greater than 2 hours.

List hospital, patient transfer? (yes or no), cause code, and ED time for patients meeting criteria.

Trauma patients who die with a probability of survival (TRISS) > 50%. (TRISS score for trauma patients using physiologic measures collected at the first presenting hospital.)

List hospital, age, cause code, transport mode, ISS, outcome, LOS, and TRISS for patients meeting criteria.

Trauma patients who live with a probability of survival (TRISS) < 50%. (TRISS score for trauma patients using physiologic measures collected at the first presenting hospital.)

List hospital, age, cause code, transport mode, ISS, outcome, LOS, and TRISS for patients meeting criteria.

TRISS determines the probability of survival (Ps) of a patient from the ISS and RTS using the following formula: $Ps = 1 / (1 + e^{-b})$

Where 'b' is calculated from:

$$b = b0 + b1(RTS) + b2(ISS) + b3(AgeIndex)$$

The coefficients b0 - b3 are derived from multiple regression analysis of the Major Trauma Outcome Study (MTOS) database. Age Index is 0 if the patient is below 54 years of age or 1 if 55 years and over. b0 to b3 are coefficients which are different for blunt and penetrating trauma. If the patient is less than 15, the blunt coefficients are used regardless of mechanism.

	Blunt	Penetrating
b0	-0.4499	-2.5355
b1	0.8085	0.9934
b2	-0.0835	-0.0651
b3	-1.7430	-1.1360

The TRISS calculator determines the probability of survival from the ISS, RTS and patient's age. ISS and RTS scores can be inputted independently or calculated from their base parameters.

Trauma patients with an ISS greater than 15 who are discharged from non-trauma centers.

List hospital, age, cause code, transport mode, ISS, outcome, discharge disposition, and time to discharge for each patient meeting criteria.

Trauma patients transported by EMS without an associated ambulance report in the medical record.

List percentage of missing run reports by transport mode and EMS agency.

Trauma patients less than 13 years old (children) who either had an ED GCS less than or equal to 8, intubation, or ISS greater than 15 and not transferred to a regional pediatric trauma center.

List hospital, age, ED GCS, ISS, cause code, LOS, and transport mode for each patient meeting criteria.

L. Texas Example of Recommended Performance Measures

North Central Texas Trauma Advisory Council

System Quality Performance Improvement Process

Referral Guidelines

Purpose: To develop guidelines and structure to standardize the referral process for a system performance review.

Procedure: All entities within the North Central Texas Trauma Advisory Council (NCTTRAC) will participate in the System Quality/Performance Improve Process. NCTTRAC's System Quality/Performance Improvement Committee (SQIC) has the responsibility for maintaining the review process. All entities will follow the established guidelines for submission of information and system referrals. All records will be maintained in an organized, confidential manner. No documents will be disseminated.

Guidelines:

1. The SQIC has established the performance standards for the regional trauma system.
2. All entities participating in NCTTRAC will comply with the performance standards.
3. Submission of the regional trauma registry data will follow the established guidelines.
4. Performance standards that are not met will be referred to the SQIC for review.
5. Participating members of NCTTRAC will complete the attached referral tool, attach support documentation and present the referral to the Chair of the SQIC or SQIC Sub-Committee Chairs, Executive Director, Chair of the Executive Committee or Vice Chair of the Executive Committee or present the referral to the SQIC. Records must be maintained in a manner that no patient identifiers submitted.
6. SQIC meeting dates and times will be posted.
7. Referral presentations to the Referral Review Sub-Committee shall be done privately.
8. Information for referral review can not be mailed.
9. All SQIC committee and sub-committee members must sign and abide by the statement of confidentiality. This record will be maintained in the NCTTRAC records.

10. The Referral Review Sub-Committee will review the documentation and define an action plan.
11. The Referral Review Sub-Committee will maintain confidentiality regarding all matters.
12. All documentation will be maintained under the performance improvement guidelines and remain confidential.
13. Automatic referrals to the SQIC Committee are defined in the Performance Standards.
14. The SQIC Referral Review Sub-Committee will track the action plan for completion. Issues that do not meet the deadline or remain open will be referred to the entire SQIC committee and potentially to the Executive Committee.
15. The Executive Committee may call a “closed” meeting to review specific issues.
16. All information will remain confidential.

North Central Texas Trauma Advisory Regional Council
System Quality/Performance Improvement Committee
System Referral

Date of Referral:_____ Referred by:_____
Age:_____ M / F MOI:_____ Date of Injury:_____ Time of Injury:_____
Performance Standard:

Time	Assessment/ Activities/ Interventions

Findings:_____
_____
_____

Committee's Response	Standard of Practice	Contributing Factors	Plan
1. Delay in system, not negative outcome	1. RAC guidelines not followed, time delays appropriate	1. System inadequacy, access greater than 30 minutes	1. No further action
2. Delayed system response. Minor negative outcome	2. RAC guideline not followed, minor deviation,	2. Delayed dispatch	2. Reviewed with agency
3. Significant system error.	3. RAC guidelines not followed, significant error	3. Delayed EMS response	3. Track and trend
4. Major deviation from system response.	4. RAC guideline not followed, Significant error, delay in diagnosis or judgement interpretation, error in technique	4. Delayed or prolonged transport, excessive scene time	4. Educational need
		5. Communications problems • Dispatch • EMS • Helicopter • Hospital • Surgeon • OR	5. RAC guideline review
		6. Transfer problems • Delayed request • Delayed acceptance • Delayed transport	6. Provider action plan requested
		7. Trauma diversion	7. Refer to State
		8. Multiple casualties	8. PI work group assigned
		9. Services not available	9. Forward to Executive Committee for review
		10. Provider	

_**Non-Preventable Death**: injuries non-survivable with optimal care	_**Potentially Preventable Death**: injury severe but survivable with optimal care	_**Preventable Death:** injuries are physiologically survivable

Date of Review:
Comments:_____

Case Discussion

Action Plan / Responsible Individual

Recorder:_____ Date:_____

North Central Texas Trauma Advisory Council

System Quality / Performance Improvement Committee

Purpose

The North Central Texas Trauma Regional Advisory Council's (NCTTRAC) System Quality / Performance Improvement Committee's (SQIC) purpose is to define the performance standards and performance review process for the regional trauma system.

Methodology

All entities providing medical care to the injured patient within NCTTRAC are required to participate in the system quality / performance initiatives. Participation will include submission of information to the regional trauma registry, submission of requested monthly data, compliance to standard performance referrals, and participation in referral reviews. Each entity will follow the established procedures to ensure confidentiality and compliance to regulatory standards.

The Bylaws of NCTTRAC define a standing System Quality / Performance Improvement Committee. The committee structure will follow these Bylaws. Committee members are selected by the SWIC Chair and approved by the Executive Committee Chair and Executive Committee. Each SQIC committee member will receive an orientation to the committee and be required to sign a statement of confidentiality. The committee chair / designee will be responsible for professionalism, confidentiality, and to define areas where "conflict of interest" are a potential. The NCTTRAC members are responsible for submitting the defined information in a professional, timely, and accurate manner.

The SQIC meeting dates and times remain posted. Committee members are expected to participate in a minimum of seventy-five percent of the meetings. Referral reviews will be closed to non-committee NCTTRAC members and other individual requesting participation. The SQIC Chair has the authority to request a closed meeting through the Executive Committee Chair to review sensitive issues and ensure confidentiality for all parties.

Scope

The NCTTRAC System Quality / Performance Improvement Committee shall review all aspects of the trauma system within the nineteen county region. This includes the access, dispatch, pre-hospital management, transport, hospital access, transfers, mortality reviews, access to rehabilitation, continuing educational opportunities, and prevention initiatives. Regional registry, disaster response, zone issues, and NCTTRAC Executive Committee performance will also be reviewed. Performance standards for

each area are defined by the SQIC and submitted to the Executive Committee for approval. All performance standards and expectations will be communicated to the general membership through General Membership Meetings, the newsletter, zone meetings, and written communication.

Practice

All activities of the SQIC will be in compliance of the established NCTTRAC Bylaws. Information will be submitted following the standard procedures defined.

PERFORMANCE STANDARDS

Dispatch

All individuals responsible for dispatch will have appropriate training defined by their job description.
All dispatch agencies will have systems in place to monitor compliance to established procedures. Dispatch will maintain a current disaster response plan.

EMS

EMS will have an average response time of fifteen minutes.
EMS scene time will not exceed twenty minutes.
EMS (ground) transport times will not exceed thirty minutes.
Air-Medical scene response times will be within thirty minutes.
EMS will communicate patient reports to the receiving facility (direct or through dispatch).
EMS will complete the EMS run sheet and leave in the emergency department.
EMS will maintain a performance improvement process.
EMS will maintain a current disaster plan / mutual assistance agreement.
EMS providers will maintain appropriate credentialing process for EMS providers.
EMS providers will follow established NCTTRAC Pre-Hospital Guidelines.
EMS providers will have appropriate training and access to continuing education.
EMS will submit required statistical data and trauma registry data within twenty days of the new month (January data will be submitted by February 20th).

Hospital

Hospitals will meet and maintain the appropriate trauma facility designation at all times. *
Hospitals will meet the EMS provider, accept the patient, and transfer the patient to a hospital stretcher within fifteen minutes. *

Hospitals will maintain trauma management protocols throughout the continuum of care.
Hospitals will maintain a current disaster / mutual aid response.
Hospitals will maintain a trauma performance improvement process to review all aspects of trauma care.
Hospitals will communicate diversion status.
Hospitals will initiate trauma transfers within one hour of arrival.
Trauma patients will be transferred within two hours of arrival.
Transfers will be to a higher level of designated trauma facility (single system injuries with ISS less than 9 excluded)*
Trauma patients will only be transferred one time.
Receiving hospitals will accept the trauma patient within an average of fifteen minutes.
Receiving hospitals will provide transferring facilities with feedback within thirty days.
Hospitals will submit required statistical data and trauma registry data within twenty days of the new month (January data will be submitted by February 20th).

Pediatric Standards

Hospitals will accept the pediatric trauma patient within an average of fifteen minutes.
Hospital will maintain pediatric specific trauma indicators.
Hospitals will review all pediatric trauma deaths.
Hospitals will transfer pediatric trauma patients within 2 hours.
Pediatric trauma patients will only be transferred one time to the most appropriate facility.*
All in-patient pediatric trauma transfers will be reviewed through both hospital trauma performance improvement processes and the RAC SQIC process.*
Pediatric trauma patients in need of an ICU care will be transferred to a tertiary care center with pediatric ICU capability within one hour.*
Pediatric trained transport teams will be available within thirty minutes of request.
Receiving hospitals will provide transferring facilities with feedback within thirty days of the pediatric transfer.
Hospital providers will have appropriate pediatric specific training and access to pediatric specific education.
All pediatric transfers occurring within the trauma service area- E area will be initiated and remain in NCTTRAC area. *

Air-Medical Services

Air-Medical Services will follow established NCTTRAC guidelines.
Air-Medical Services will maintain a performance review process.

Air-Medical Services will maintain a current disaster plan/ mutual aid agreements.
Air-Medical Services providers will have appropriate training and access to continuing education.
Air-Medical Services will submit statistical data and trauma registry data within twenty days of the new month (January data will be submitted by February 20).

Transfers

ED to ED trauma transfers will be initiated within one hour of arrival.
Receiving hospitals will accept the patient within an average of fifteen minutes.
Trauma patients will only be transferred one time to the most appropriate facility.*
Trauma patients will be transferred to a higher level of designated trauma facility (ISS less than 9 with single system injury excluded).*
Ground transport will be available within thirty minutes for transfer.*
Air-Medical Services will be available within sixty minutes.*
All in-patient trauma transfers will be reviewed through both the hospital trauma performance improvement process and the RAC system performance review process.
All trauma patient transfers will be managed within the trauma service area-E (patient transferred in from outside of NCTTRAC or transferred out of NCTTRAC). *

Rehabilitation

All trauma patients will have access to rehabilitation.
Trauma patients will be appropriately discharged to rehabilitation.

Mortality Review

Mortality information submitted to the SCIC from Vital Statistics and TDH will be reviewed.

Trauma Registry

To be defined.

Zone

Each zone will conduct one NCTTRAC meeting quarterly.
Each zone will have one continuing education meeting quarterly.

Disaster Response

All entities within the RAC will have a disaster plan / mutual assistance agreement.
All entities within the RAC will have an organized disaster management plan that defines their hospital incident commander/leader.
Response will be ready within ten minutes of notification.
Field triage area established within fifteen minutes of notification.
ED ready within ten minutes of notification.
Tracking process for system is initiated within ten minutes.
Communication tracks status of all entities.
System de-activation meets overall needs.
Critique of system response is completed within thirty days of incident.
Report submitted to NCTTRAC within thirty days.

NCTTRAC

NCTTRAC will maintain a current membership.
NCTTRAC will maintain minutes and attendance of all meetings.
Committee chairs are responsible to submit all minutes and attendance to the program manager within ten days of the meeting.
NCTTRAC will provide a quarterly newsletter.
NCTTRAC will maintain minutes and attendance of all meetings.
Committee chairs are responsible to submit all minutes and attendance to the program manager within ten days of the meeting.
NCTTRAC will provide a quarterly newsletter.
NCTTRAC will maintain current Bylaws.
NCTTRAC will maintain Standard Operation Procedures.
NCTTRAC Executive Committee Members will represent the region in a professional, confidential manner that represents the general membership.
NCTTRAC will maintain all records.
NCTTRAC will file financial reports with TDH in a timely manner.
NCTTRAC will provide a budget analysis at each general membership meeting.

- Indicates an automatic referral to the RAC SQIC.

All performance standards have been reviewed by the appropriate committees for approval and approved by the Executive Committee.

North Central Texas Trauma Regional Advisory Council

System Quality / Performance Improvement Committee

System Referral Institutional Tracking

Patient Name / MR #	Date of Referral	Issue	Date of Committee Review	Action Plan	Status / Comments